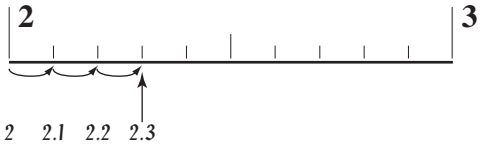
10. [Decimals]

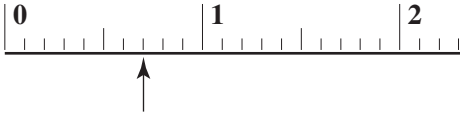
Skill 10.1 Reading a decimal number on a scale.

- Count the number of spaces between two whole numbers.
  (Always one more than the number of marks.)
- Work out the value of each space.
  Example: 10 spaces between each whole number $\Rightarrow 1 \div 10 = 0.1$
  Each mark is further along the scale by one tenth or 0.1



- Starting at the last whole number, count on by 0.1. Point to each mark as you go.

Q. What value is indicated by the arrow on the scale below?



A. ***0.7***

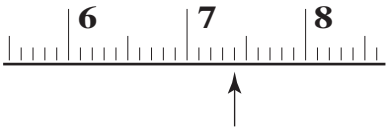
There are 10 spaces between 0 and 1.

Each space is worth $\frac{1}{10} = 1 \div 10 = 0.1$

From '0' you can count on:
0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7

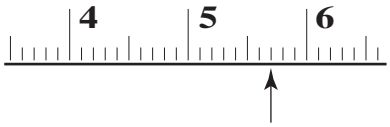
OR
Knowing the middle mark is 0.5, count on from 0.5:
0.5, 0.6, 0.7

a) What value is indicated by the arrow on the scale below?



7.4

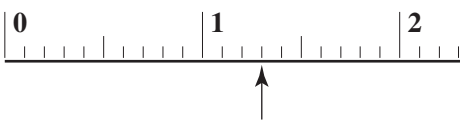
b) What value is indicated by the arrow on the scale below?



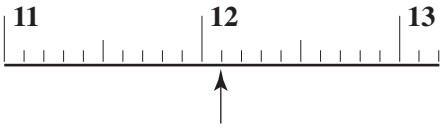
c) Show with an arrow the number 4.8 on the scale.

d) Show with an arrow the number 6.6 on the scale.

e) What value is indicated by the arrow on the scale below?



f) What value is indicated by the arrow on the scale below?



Skill 10.2 Comparing place value in decimal numbers.

- Line up the decimal numbers at their decimal points.
- Compare the size of digits in the same places, starting from the left.

thousands	hundreds	tens	units	tenths	hundredths	thousandths
			decimal point			
1000	100	10	1	0.1	0.01	0.001

Hint: Using zeros as place holders does not change the value of a number when the zeros are put:

EITHER

***Before** a digit*
(if it has a value greater than 0)
Example: 5
The digit 5 is in the units place
5 = 05 = 005

OR

***After** the last digit*
(if it has a value less than 0)
Example: 0.5
The digit 5 is in the tenths place
0.5 = 0.50 = 0.500

Q. Which of the following are true?

A) 6.0 = 6.00
B) 400 = 40
C) 0.7 = 0.070
D) 0.8 = 0.800

A. ***A** and **D***

Line up the numbers at their decimal points. Compare from the left.

A) 6.0 = 6.00 True
B) 400 = 40 False
C) 0.7 = 0.070 False
D) 0.8 = 0.800 True

Only A and D are true.

a) Which of the following are true?

A) 6 = 60.0
B) 50.0 = 50
C) 0.3 = .3
D) 00.2 = 2.00

B and C

b) Which of the following are true?

A) 70 = 7
B) 9 = 0.9
C) 0.5 = 0.50
D) 8.0 = 8.00

and

c) Which of the following are true?

A) 10.0 = 1.0
B) 50.0 = 50
C) 0.07 = .007
D) 4 = 4.0

and

d) Which of the following are true?

A) 90 = 90.0
B) 4 = 40.0
C) 20.0 = .20
D) 0.50 = 0.5

and

e) Which of the following are true?

A) 0.03 = 0.30
B) 0.4 = 0.40
C) 7 = 0.70
D) 8.0 = 8.00

and

f) Which of the following are true?

A) 5.0 = 5
B) 20 = 20.0
C) 0.4 = 0.004
D) .30 = 3.0

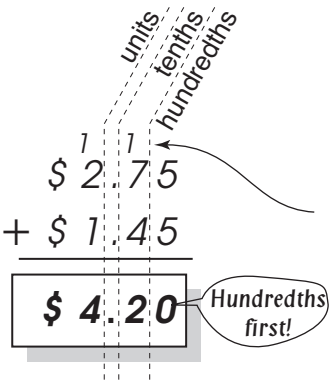
and

- Keep the units, decimal points, tenths and hundredths in their own columns.
- Work from right to left.

Q.

$$\begin{array}{r} \$\,2.75 \\ +\,\$\,1.45 \\ \hline \square \end{array}$$

A.



Hundredths:
5 + 5 = 10
10 hundredths = 1 tenth and 0 hundredths
⇒ 0 hundredths
Carry over the 1 tenth to the tenths column.

Tenths:
7 + 4 + 1 (carry over) = 12
12 tenths = 1 unit and 2 tenths
⇒ 2 tenths
Carry over the 1 unit to the units column.

Put the decimal point in the answer box under the other decimal points.

Units:
2 + 1 + 1 (carry over) = 4 ⇒ 4 units

a)

$$\begin{array}{r} {\scriptstyle 1} \\ \$\,1.50 \\ +\,\$\,3.50 \\ \hline \$\,5.00 \end{array}$$

Hundredths first!

b)

$$\begin{array}{r} \$\,4.35 \\ +\,\$\,2.45 \\ \hline \$\,\square \end{array}$$

c)

$$\begin{array}{r} \$\,2.60 \\ +\,\$\,1.45 \\ \hline \$\,\square \end{array}$$

d)

$$\begin{array}{r} \$\,3.75 \\ +\,\$\,8.05 \\ \hline \$\,\square \end{array}$$

e)

$$\begin{array}{r} 6.37 \\ +6.34 \\ \hline \square \end{array}$$

f)

$$\begin{array}{r} 4.1 \\ +3.94 \\ \hline \square \end{array}$$

g)

$$\begin{array}{r} 2.13 \\ +8.72 \\ \hline \square \end{array}$$

h)

$$\begin{array}{r} 5.65 \\ +3.8 \\ \hline \square \end{array}$$

i)

$$\begin{array}{r} 1.81 \\ 2.53 \\ +4.52 \\ \hline \square \end{array}$$

j)

$$\begin{array}{r} 5.05 \\ 6.28 \\ +1.43 \\ \hline \square \end{array}$$

k)

$$\begin{array}{r} 2.60 \\ 3.6 \\ +1.99 \\ \hline \square \end{array}$$

l)

$$\begin{array}{r} 9.81 \\ 2.57 \\ +4.13 \\ \hline \square \end{array}$$

Skill 10.4 Writing a fraction as a decimal number.

When the denominator **is** a power of 10:

Say the fraction out loud using tenths, hundredths or thousandths.
Write the last digit of the numerator in the place spoken of in the denominator.
Fill in the numerator working backwards to the decimal point.
Use zeros as place holders where necessary.
Examples:

twenty-seven

$$\frac{27}{100} = 0.27$$

hundredths

units	tenths	hundredths
0 .	2	7

Write the 7 in the hundredths place.

Decimal point

Work backwards filling in the 2.

sixteen

$$\frac{16}{1000} = 0.016$$

thousandths

units	tenths	hundredths	thousandths
0 .	0	1	6

Decimal point

Use zeros as place holders

Hint: The number of zeros in the denominator shows the number of digits after the decimal point.

$\frac{27}{100} = 0.\underline{27}$ $\qquad$ $\frac{16}{1000} = 0.\underline{016}$

Q. Write $\frac{24}{1000}$ as a decimal number.

A. ***0.024***

Read as: twenty-four thousandths.

units	tenths	hundredths	thousandths
0 .	0	2	4

Write the 4 in the thousandths place and work backwards.

Decimal point

Use zeros as place holders

a) Write $\frac{5}{10}$ as a decimal number.

five tenths

0.5

b) Write $\frac{7}{10}$ as a decimal number.

c) Write $\frac{1}{10}$ as a decimal number.

d) Write $\frac{8}{100}$ as a decimal number.

eight hundredths

e) Write $\frac{41}{100}$ as a decimal number.

f) Write $\frac{98}{100}$ as a decimal number.

g) Write $\frac{734}{1000}$ as a decimal number.

h) Write $\frac{21}{1000}$ as a decimal number.

i) Write $\frac{2}{1000}$ as a decimal number.

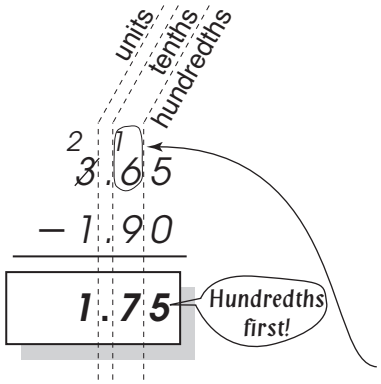
Skill 10.5 Subtracting decimal numbers with carry over using columns.

- Keep the units, decimal points, tenths and hundredths in their own column.
- Work from right to left.

Q.

$$\begin{array}{r} 3.65 \\ -\ 1.90 \\ \hline \end{array}$$

A.



Hundredths:
5 – 0 = 5 ⇒ 5 hundredths

Tenths:
6 – 9 = ? tenths.
To make the answer positive break down the 3 units.
3 units = 2 units and 10 tenths.
Re-group the 10 tenths with the 6 tenths to make 16 tenths.
Now...
16 – 9 = 7 ⇒ 7 tenths

Put the decimal point in the answer box under the other decimal points.

Units:
2 – 1 = 1 ⇒ 1 unit

a) $\begin{array}{r} 5\ 1 \\ \not{6}.65 \\ -\ 2.8 \\ \hline 3.85 \end{array}$ Hundredths first!

b) $\begin{array}{r} 3.27 \\ -\ 1.14 \\ \hline \end{array}$ Hundredths first!

c) $\begin{array}{r} 5.59 \\ -\ 2.36 \\ \hline \end{array}$

d) $\begin{array}{r} 4.84 \\ -\ 3.8 \\ \hline \end{array}$

e) $\begin{array}{r} 3.50 \\ -\ 2.45 \\ \hline \end{array}$

f) $\begin{array}{r} 2.75 \\ -\ 1.05 \\ \hline \end{array}$

g) $\begin{array}{r} 4.30 \\ -\ 1.95 \\ \hline \end{array}$

h) $\begin{array}{r} 5.55 \\ -\ 3.85 \\ \hline \end{array}$

i) $\begin{array}{r} 4.21 \\ -\ 3.04 \\ \hline \end{array}$

j) $\begin{array}{r} 4.5 \\ -\ 1.27 \\ \hline \end{array}$

k) $\begin{array}{r} 8.13 \\ -\ 0.62 \\ \hline \end{array}$

l) $\begin{array}{r} 3.66 \\ -\ 2.8 \\ \hline \end{array}$

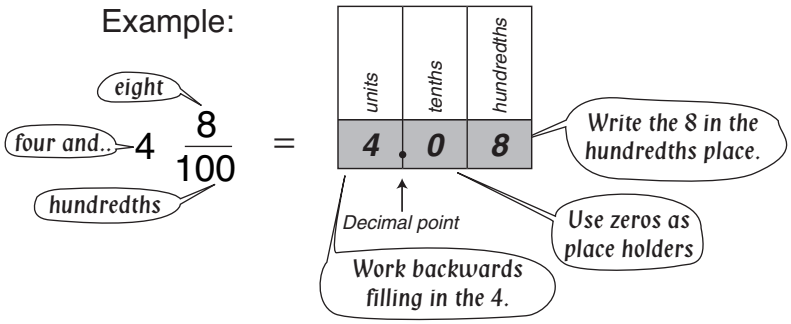
Skill 10.6 Writing a mixed number as a decimal number.

When the denominator **is** a power of 10:

- Write the whole number first.
- Place the decimal point.
- Write the fraction as a decimal number.

(see skill 10.4, page 36)

Example:



Hint: The number of zeros in the denominator shows the number of digits after the decimal point.

$\frac{16}{1000} = 0.016$

When the denominator **is not** a power of 10:

- Change the mixed number to an improper fraction.

$2\frac{3}{5}$ (×, +) $2 \times 5 + 3 = 13$

$2\frac{3}{5} = \frac{13}{5}$

- Divide the numerator by the denominator.

$\frac{13}{5} = 13 \div 5 =$ 2.6

Hint: $13 = 13.0$

$5\overline{)\overset{1}{1}\overset{3}{3}.0}$

Q. Write the mixed number $8\frac{24}{100}$ as a decimal number.

A. ***8.24***

Write the whole number, 8 units.
Put the decimal point.
Write the numerator 24, with the last digit 4 in the hundredths place.
[No zero place holders are necessary.]

Read as: Eight and twenty-four hundredths

Q. Write the mixed number $3\frac{2}{5}$ as a decimal number.

A. $3\frac{2}{5} \Rightarrow 3 \times 5 + 2 = 17$

$3\frac{2}{5} = \frac{17}{5} = 17.0 \div 5$

$= \mathbf{3.4}$

Change to an improper fraction.
Divide the numerator by the denominator.

a) Write the mixed number $5\frac{7}{10}$ as a decimal number.

$5 \times 10 + 7 = 57$

$57. \div 10 =$ 5.7

b) Write the mixed number $2\frac{46}{100}$ as a decimal number.

c) Write the mixed number $5\frac{4}{10}$ as a decimal number.

d) Write $3\frac{2}{100}$ as a decimal number.

e) Write $4\frac{1}{2}$ as a decimal number.

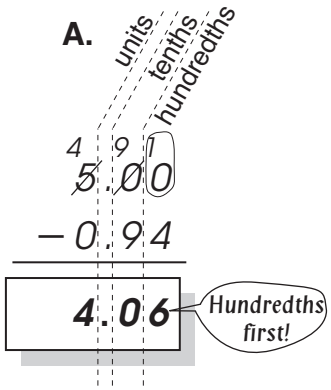
f) Write $3\frac{3}{5}$ as a decimal number.

Skill 10.7 Subtracting a decimal number less than 1 from a whole number.

- Write the whole number first, with a decimal point and one or two zeros after it.
  Hint: The number doesn't change. 5 = 5.00
- Write the decimal number underneath.
- Line up the decimal points.
- Subtract using columns. (see skill 10.5, page 37)

Q. $5 - 0.94 =$

A.



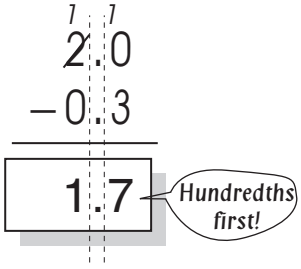
Hundredths:
0 – 4 = ? hundredths
To make the answer positive break down the 5 units:
5 units = 4 units + 9 tenths + 10 hundredths
Now....
10 – 4 = 6 ⇒ 6 hundredths

Tenths:
9 – 9 = 0 ⇒ 0 tenths

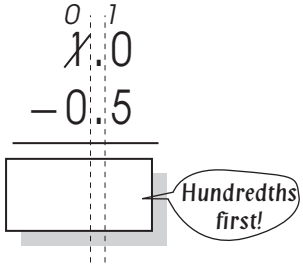
Put the decimal point in the answer box.

Units:
4 – 0 = 4 ⇒ 4 units

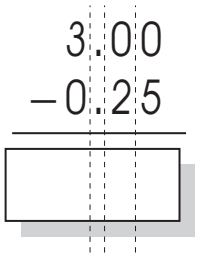
a) $2 - 0.3 =$



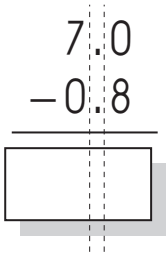
b) $1 - 0.5 =$



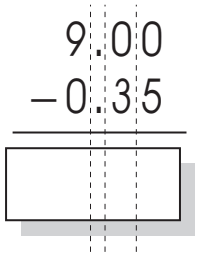
c) $3 - 0.25 =$



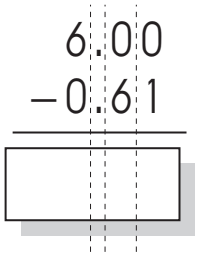
d) $7 - 0.8 =$



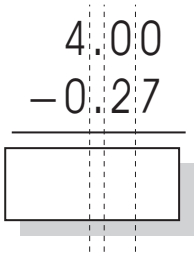
e) $9 - 0.35 =$



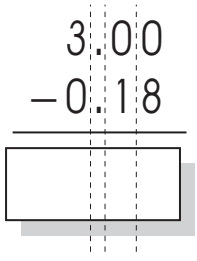
f) $6 - 0.61 =$



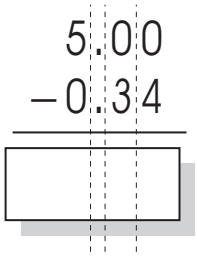
g) $4 - 0.27 =$



h) $3 - 0.18 =$



i) $5 - 0.34 =$



Skill 10.8 Writing an improper fraction as a decimal number.

When the denominator **is** a power of 10:

- Divide the numerator by 10, 100 or 1000 by moving the decimal point the same number of places to the left as there are zeros. Examples:

÷ by 10 (1 zero ⇒ 1 place left) $16.0 \Rightarrow 1.6$

÷ by 100 (2 zeros ⇒ 2 places left) $016.0 \Rightarrow 0.16$

÷ by 1000 (3 zeros ⇒ 3 places left) $0016.0 \Rightarrow 0.016$

Hint: Fractions are just divisions.
Hint: There is a decimal point and zeros which are not written, at the end of any whole number. The number doesn't change. 16 = 16.0

Example: $\frac{16}{10} = 16 \div 10$
$= 16.0 \div 10$
$= 16.0 \div 10 = 1.6$

When the denominator is **not** a power of 10:

- Multiply both the numerator and denominator by the same number to make the denominator a power of 10. Example:

$\frac{74}{50} = \frac{74}{50}\overset{\times 2}{} = \frac{148}{100}$ (power of 10)

- Then divide by moving the decimal point.

Example: $\frac{148}{100} = 148 \div 100$
$= 148.0 \div 100$
$= 148.0 \div 100 = 1.48$

Q. Write $\frac{136}{100}$ as a decimal number.

A. $\frac{136}{100} = 136 \div 100$
$= 136.0 \div 100$
$= 136.0 \div 100$
$= \mathbf{1.36}$

Write the numerator 136 with a decimal point. 136 = 136.0
To divide by 100 (2 zeros) move the decimal point 2 places to the left.

Q. Change the improper fraction $\frac{12}{5}$ to a decimal number.

A. $\frac{12}{5}\overset{\times 2}{} = \frac{24}{10}$
$= 24.0 \div 10$
$= 24.0 \div 10$
$= \mathbf{2.4}$

Multiply the denominator and the numerator by 2 to make the denominator a power of 10.

a) Change the improper fraction $\frac{27}{10}$ to a decimal number.

$27 \div 10$

$27. \div 10 =$ 2.7

b) Change the improper fraction $\frac{245}{100}$ to a decimal number.

c) Change the improper fraction $\frac{8}{5}$ to a decimal number.

d) Write $\frac{11}{2}$ as a decimal number.

e) Write $\frac{9}{2}$ as a decimal number.

f) Write $\frac{9}{5}$ as a decimal number.

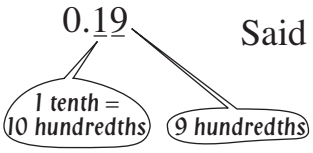
Skill 10.9 Writing a decimal number as a fraction.

From left to right (ignoring zeros if they start the number) write the digits as the numerator. Use the place value of the last digit of the decimal number to determine the size of the denominator. (See also 10.4, page 36)

Q. Write 0.19 as a fraction.

A. $0.19 = \frac{19}{100}$

Write 19.
The nine is in the hundredths place.
Write 100ths as the denominator.
Said as: $\frac{19}{100}$ 'nineteen hundredths'



a) Write 0.5 as a fraction. $\frac{5}{10}$

b) Write 0.9 as a fraction.

c) Write 0.7 as a fraction.

d) Write 0.3 as a fraction.

e) Write 0.2 as a fraction.

f) Write 0.1 as a fraction.

g) Write 0.29 as a fraction. $\frac{29}{100}$

h) Write 0.83 as a fraction.

i) Write 0.41 as a fraction.

j) Write 0.35 as a fraction.

k) Write 0.19 as a fraction.

l) Write 0.17 as a fraction.

m) Write 0.03 as a fraction. $\frac{3}{100}$

n) Write 0.05 as a fraction.

o) Write 0.09 as a fraction.